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Reed W. Bailey, Director

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SEEDING GRASS ON DETERIORATED ASPEN RANGE

By A. Perry Plummer, Asst. Forest Ecologist,
and George Stewart, Sr. Forest Ecologist

The herbaceous undercover on much of the aspen range in the Intermountain region is badly deteriorated. These areas, naturally highly productive, when revegetated can contribute greatly towards a much needed supply of range forage. One of the major obstacles to successful seeding has been the difficulty of getting the seeds covered with soil since both standing and fallen trees interfere with the use of drills, harrows, or other machinery. In the search for methods to overcome this difficulty, it was found that for open aspen stands the covering of seeds is unnecessary when the right precautions are taken in other phases of planting.

On the basis of results obtained from experiments still in progress and some older large-scale plantings made by national forests, it seems clear that when seeds are broadcast shortly before, during, or soon after leaf fall, the leaves form a mat that conserves the surface soil moisture long enough for young seedlings to establish themselves. Adapted species must of course be used, but among the best are several species not yet available commercially. Fortunately, a very well adapted species, smooth bromegrass and three other really good ones, tall oatgrass, orchardgrass, and timothy, are usually available. Success has been so great with scattering seed in open stands of aspen at such a time as will permit falling leaves to cover the seed or to permit seeds to work down into freshly fallen leaves, that an immediate extensive action program is justified. Further studies will no doubt contribute to the effectiveness of future aspen range reseeding.

NATURE OF EXPERIMENTS

Each of 14 species, listed in table 1, were broadcast on four plots, 10x14 feet, prior to leaf fall and immediately after leaf fall in 1941 and 1942. After the seeds were scattered, half of the plots were treated with a single section of a self-clearing harrow, which effectively buried the seeds. The other half of the plots were untreated except for scattering the seed. Rate of seeding per acre varied from 6 to 30 pounds, depending on the size of seed of each species. Species included were those which in an adjacent species study had shown themselves to be particularly well adapted.

The site is in the lower aspen zone on the Manti Forest, where the annual precipitation varies between 16 and 25 inches.

WHAT THE TESTS SHOW

Although the tests are not as yet completed, some partial conclusions and suggestions which have general application for seeding in aspen stands are warranted.

1. At least eight well adapted species have been found for seeding under aspen. There are probably several others.

2. Merely broadcasting the seed of adapted species under aspen before, during, and subsequent to leaf fall generally produces good stands.

3. The slightly better stands that may occasionally result from covering the seed do not justify the procedure. Any better stands that result from covering the seed could probably be equalled by broadcasting the seed at a somewhat heavier rate.

4. It appears to make no practical difference, generally, whether the seed is broadcast prior to, during, or soon after leaf fall.

Table 1 gives the average plot ratings of the young stands for the first two years after the 1941 seedings and for one year after the 1942 seeding. In scanning the table, it must be remembered that ratings are based on young stands. In another two or three years, ratings of some species will probably change materially. These observations do show, however, that the difference in effectiveness of the methods employed is too negligible to warrant a conclusion that covering seed is superior to broadcasting without covering. The labor and difficulty of covering the seed in aspen cannot be justified or recommended on the basis of these tests.

Common and Botanical Names of Species Mentioned in Table 1

Bearded wheatgrass	Agropyron subsecundum
Big bluegrass	Poa ampla
Blue wildrye	Elymus glaucus
Canada wildrye	Elymus canadensis
Kentucky bluegrass	Poa pratensis
Letterman needlegrass	Stipa lettermanii
Meadow fescue	Festuca elatior
Mountain bromegrass	Bromus carinatus
Mountain lupine	Lupinus alpestris
Orchardgrass	Dactylis glomerata
Showy goldeneye	Viguiera multiflora
Slender wheatgrass	Agropyron trachycaulum
Smooth bromegrass	Bromus inermis
Tall oatgrass	Arrhenatherum elatius

Table 1.- Average relative ratings of the 14 species in order of their average composite ratings one and two years after the 1941 plantings and one year after the 1942 plantings.

Treatment		Broadcast before leaf fall						Broadcast after leaf fall						Average composite species rating
		Not covered			Covered			Not covered			Covered			
Year planted		1941		'42	1941		'42	1941		'42	1941		'42	
Years rated following plantings		1st yr. '42	2nd yr. '43	1st yr. '43	1st yr. '42	2nd yr. '43	1st yr. '43	1st yr. '42	2nd yr. '43	1st yr. '43	1st yr. '42	2nd yr. '43	1st yr. '43	
Species[2]	Rate sown p/a.	Relative plot ratings[1]												
1 Bearded wheatgrass	12	9.0	9.0	9.0	10.0	9.0	8.5	9.5	9.0	8.5	9.5	9.5	8.5	9.1
2 Mountain bromegrass	20	6.5	8.5	10.0	9.5	8.5	9.5	8.5	8.5	7.5	9.0	9.0	9.5	8.7
3 Blue wildrye	12	9.0	8.0	9.5	9.0	7.5	8.5	8.0	7.0	9.0	8.5	8.5	9.5	8.5
4 Tall oatgrass	12	8.0	6.5	9.5	8.5	7.0	9.0	8.5	7.5	9.0	7.5	7.5	9.0	8.1
5 Orchardgrass	8	5.0	5.0	10.0	3.0	6.5	10.0	7.5	7.5	8.5	7.0	7.0	10.0	7.2
6 Slender wheatgrass	10	9.0	8.5	9.0	9.5	8.5	8.5	4.0	8.5	6.0	1.5	0.5	8.5	6.8
7 Mountain lupine	30	3.5	6.5	8.5	5.5	4.0	8.5	5.0	6.5	7.5	3.5	6.0	9.0	6.2
8 Smooth bromegrass	10	4.0	3.5	8.5	4.5	8.0	6.5	2.5	2.0	4.5	7.0	9.0	8.5	5.7
9 Letterman needlegrass	10	7.5	6.0	1.5	9.0	7.0	1.0	4.0	1.5	2.5	9.0	7.5	6.5	5.3
10 Showy goldeneye	6	7.0	7.0	3.5	3.5	7.0	2.0	4.5	3.5	2.5	7.0	7.0	6.5	5.1
11 Canada wildrye	20	7.5	4.5	0.5	8.0	6.0	1.0	3.5	5.0	1.0	6.0	5.5	4.5	4.4
12 Meadow fescue	8	2.5	2.0	6.5	3.5	6.5	6.0	1.0	1.5	5.0	3.5	5.0	7.5	4.2
13 Big bluegrass	6	1.5	0.5	4.5	2.0	2.5	1.5	3.5	1.5	3.0	1.0	4.0	5.0	2.5
14 Kentucky bluegrass	6	0	0.5	0	0	1.5	1.5	0	1.5	3.5	1.5	4.0	3.0	1.4
Averages		5.7	5.4	6.5	6.1	6.4	5.9	5.0	5.1	5.6	5.8	6.4	7.5	
Treatment averages		5.9			6.1			5.2			6.6			

1/ Relative rating is made on the following basis: 0=0, 1-2=very poor, 3-4=poor, 5-6=medium, 7-8=good, 9-10=very good. Number of plants, average height and diameter, distribution and vigor, as they affect the chances for future success are taken into account

2/ Scientific names of species listed on page 2.

LARGE-SCALE PLANTINGS

Two large broadcast plantings under aspen on the Uinta National Forest have been seeded long enough to establish broadcasting as a satisfactory method in this type.

Approximately a 300-acre planting under aspen and adjacent openings was made in Payson Canyon during 1934, a year of severe drought. A mixture of smooth bromegrass, Kentucky bluegrass, commercial slender wheatgrass, and crested wheatgrass was used. In the openings, which were supporting only annual weeds, the seeds were covered with a spike-toothed harrow after broadcasting. In 1935 the entire planting appeared to have failed. By 1938, however, smooth bromegrass and Kentucky bluegrass had produced good stands in the aspen, but the plantings in the openings continued to be largely failures. General estimates showed that enough smooth bromegrass was produced in the aspen to equal one cow month per acre and bluegrass about one-half that much. The best areas of smooth bromegrass produced nearly two cow months of forage per acre.

On a similar 400-acre 1935 planting in Diamond Fork, where a mixture of commercial slender wheatgrass, crested wheatgrass, and smooth bromegrass was used, the bromegrass produced in 1944 approximately two cow months of forage per acre in the aspen and formed a good sod. Crested wheatgrass and slender wheatgrass did not do well in the aspen, but along the edges of the aspen and in some of the sagebrush openings produced about one-third as much forage as smooth bromegrass.

These large-scale plantings attest the fact that open aspens are an unusually favorable situation for direct broadcasting with adapted species and that smooth bromegrass is very successful in this type.

ADAPTED SPECIES

Bearded wheatgrass, mountain bromegrass, blue wildrye, tall oatgrass, orchardgrass, and slender wheatgrass were the most aggressive of the 14 species in establishing initial stands. Timothy (Phleum pratense), not included in this study but in an adjacent species test, has also demonstrated that it is an aggressive and well adapted species.

The relatively mediocre showing of smooth bromegrass in this study is partly a result of the fact that it starts slowly and partly because it was more sensitive to attack by gophers. In view of its vigor and high production in older stands under rather similar conditions, there seems little doubt that smooth brome will do well as the stands develop.

All of the eight species mentioned have demonstrated sufficient adaptability that they are recommended for use in seeding under depleted aspen canopies. Where seed of all eight species may be available the following mixture is suggested:

	Pounds per acre
Bearded wheatgrass	2
Slender wheatgrass	2
Tall oatgrass	2
Mountain bromegrass	3
Smooth bromegrass	3
Blue wildrye	2
Orchardgrass	1
Timothy	1
Total	16

Satisfactory commercial seed sources of four of the most aggressive species (bearded wheatgrass, slender wheatgrass, mountain bromegrass, and blue wildrye) are not now available. Seeds collected from native stands of these species, however, are very good. While mountain brome and slender wheatgrass seeds are on the market, they are not from suitable strains for planting on forest ranges in the Intermountain region. Most of such mountain brome seed is derived from the northwestern United States and Idaho, and the slender wheatgrass comes from the Plains states.

Where suitable seed of some of the recommended species cannot be secured, seed of those available may be mixed in the proportions shown, and broadcast at a rate of 15 to 16 pounds per acre. No definite recommendation as to a mixture has yet been developed. In almost any circumstance, however, it is suggested that the mixture include three to four of the recommended species. Smooth brome should be in the mixture, and if possible slender wheatgrass and mountain brome of local origin. Bearded wheatgrass, tall oatgrass, and blue wildrye are good substitutes for mountain brome and slender wheatgrass. Smooth brome is the strongly recommended species. The older plantings have shown it to be productive, persistent, and well adapted under aspen.

Of the adapted species usually available commercially the following mixture of seeds would be satisfactory:

	Pounds per acre
Tall oatgrass	3
Orchardgrass	3
Timothy	2
Smooth bromegrass	8
Total	16

While not so satisfactory as either suggested mixture, it would still be worthwhile to seed 15 or 16 pounds of smooth bromegrass alone or with one or two of the other species.

Tests are not sufficiently advanced as to make it possible to say that any few species are the best. Perhaps in the near future other species will prove to be as good if not superior to some here recommended.

Kentucky bluegrass may prove a suitable species for seeding in aspen stands. It is well adapted, but very slow to establish initial stands except on sites somewhat more moist than ordinary. Observations on older plantings show that in many cases a good stand develops three to five years after seeding. In table 1 Kentucky bluegrass has the lowest rating of the 14 species. Perhaps in another two years, as older plantings show, the rating of this grass will be much higher since a few plants may develop into a good stand. The volume of forage furnished by Kentucky bluegrass is relatively small compared with other species, but like smooth brome, it forms a sod.

TIME OF PLANTING

Tests have not yet shown just how early and how late in the season it is possible to broadcast seed with assurance of success. On the basis of present data, seed may be broadcast three to four weeks prior to leaf fall or three weeks after, or until leaf movement ceases.

It is believed that the reason for the good stands resulting from merely broadcasting under the aspens results from the leaves forming a mat over the seeds. The leaf mat conserves the surface soil moisture sufficiently well and long enough in the spring that the young seedlings can become well established. It is likely, therefore, that seeds broadcast after the leaves are thoroughly matted would not be in so favorable a position for germination and establishment as those in loose leaves or under them.

AIRPLANE SEEDING POSSIBLE

Since broadcast plantings of adapted grass species are successful, it may be that the airplane would prove an expedient and suitable means for seeding extensive areas of deteriorated aspen. The chief difficulty would probably be to get the seed broadcast in sufficiently uniform spread. This method needs testing.